

SECTION V (5)

PUBLIC HEALTH ENGINEERING TECHNICAL SPECIFICATIONS

1. WATER SUPPLY, PLUMBING AND SANITARY FITTINGS

1.1 Materials / Fittings / Fixing Accessories

1.1.1 All Sanitary ware (except flushing cistern) shall be of white vitreous china best quality ISI marked. The samples of sanitary fittings, fixing accessories shall be approved by the Engineer-in-charge before bulk procurement for incorporation in the work. Sanitary ware shall be of makes as mentioned in the list of approved makes / agencies conforming to the catalogue numbers where referred to in these tender documents. ISI marked fittings of these brands shall be provided instead of those without ISI marked.

1.1.2 The contractor shall employ qualified and licensed plumber for supervision of installation and testing of the sanitary fittings and plumbing. The connection shall be provided as indicated in drawings. The layout of water pipelines, location of fixtures, soil, waste, vent and anti-siphonage pipes shall be marked on the walls in colored chalk and approved by the Engineer-in-charge before execution of work. The unit rates of Water Supply & Sanitary shall also include inter-alia the provision of the following:

- (a) All sanitary ware, fittings, fixtures, PVC SWR Pipes of 6 kg / sq cm embedded in Concrete, accessories, etc., of first quality ISI marked, construction of Manholes, STP, Earth Work Excavation, Filling etc. complete.
- (b) All CP Fittings, CPVC Pipes for Water Supply Pipelines, chasing the Walls & Floors, making good after fixing the Pipes & Fixtures,
- (c) All waste pipes of PVC SWR 6 kg / sq cm up to and including provision of gully traps embedded in concrete below ground level. Waste pipe from gully traps to first manhole
- (d) Vent pipes
- (e) All water Supply plumbing pipes. shall be of CPVC Pipes of SDR 11 Grade.

1.2 SANITARY, C.P. FITTINGS & OTHER ITEMS

1.2.1 Water closet (Pedestal Pattern)

European type Vitreous China wash down water closet pan (pedestal pattern), white (excluding fixing bolts, flushing cistern, conforming to IS : 2556 – Part – 1, shall be 40 cm high, wash down pattern with concealed “P” or “S” trap as directed including black plastic closed pattern with flat bottom hinge and lid solid type seat cover with rubber buffers, conforming to IS: 2548 Part-I – 1996 complete,

Low Level Flushing cistern shall be of PVC of 3 / 6 liters dual capacity white coloured, ISI marked conforming to IS: 7231 with 32 mm bore polythene flush pipe of sufficient length internal fittings (valve less symphonic) feather touched / brass handle and pair of painted cast iron brackets as directed by Engineer-in-charge

.Cisterns shall be fixed to walls by means of suitable size screws and wooden plugs Water closets shall be fixed with brass screws of appropriate size. Jointing of flush pipe to water closet flushing run & Cones with India Rubber with canvas backing shall be done with red lead cement.

The WC shall be fitted with health faucet, chromium plated rising spray with wall brackets with 1.5 m long metallic flexible tube, as approved.

1.2.2 Wash Hand Basins

Wash Hand Basins of both Rectangular & Oval Shape shall be of approved make. All rectangular wash hand basins shall be of required size wall mounting type of shape as per the directions of Engineer.

All Angle Back / Oval wash basins shall be of size 550 x 400 shall be mounted on Counters with Granite Top.

Wash Basins shall include all necessary arrangements.

Each Wash Hand Basin shall consist of following: -

- (i) CP brass waste fitting 32 mm dia.
- (ii) CP brass bottle trap 32 mm with CP brass pipe to wall with CP brass cast wall flange.
- (iii) CP brass pillar taps 15 mm conforming to IS 8931 – 1993 shall be provided.
- (iv) PVC Waste pipe 32 mm dia (medium grade)
- (v) The brackets shall be embedded in walls in cement concrete (1:2:4) type B1 block of size 10 cm x 10 cm x 23 cm. Necessary counter shall be provided where shown on drawing..
- (vi) PVC connection 15 x 450 mm Angle Valve

1.2.3 Stainless Steel Lab,Kitchen Sink

Supplying & fixing IS marked (IS : 13983) single bowl Stainless Steel kitchen sink (Bluestar/ Nirali) with drainage board in regular range, glossy finish, made of stainless steel 1 mm thick of grade 304 AISI 18 / 8, with overall size 41 " x 20 "x and

bowl size 20 " x 16 " of 8 " depth with side boarder, as specified in IS Code, including CI Cantilever Brackets, including coupling.

1.2.4 Mirror

Size of mirror shall be 600 mm x 450 mm in 5 mm thickness with beveled edges having back side support of HIPS (An Engineering Thermoplastic) Sheet of 600mm X 450mm in 2mm thickness pasted with vacuum pressure Techniques and beveled edges are covered with silicon coating. Provided with 4 round Steel Studs of 7mm thickness in 19 mm dia on front side to support 2 Steel wall hanging hooks with Plastic washer on the back side

1.2.5 Towel Ring

Towel Ring of PTMT fixed with and including Chromium plated brass screws and wooden/plastic cleats (Minimum weight 90gms)

1.2.6 Toilet Paper Holder

Vitreous Colour / CP Brass Toilet paper holder shall be provided in all Toilets.

1.2.7 Floor Traps/Multi traps

Floor trap shall conform to IS codes and shall be of PVC with PVC grating and outlet with nominal diameter of 75mm shall be provided in the situations where shown on drawings. The outlet of floor trap shall be with long arm and shall be jointed to connecting pipe / branch pieces with joint. Multi Floor trap shall be provided in lieu of nahani trap wherever required as shown / specified on drawings.

1.2.8 Gully Trap

Providing and fixing square mouth S.W Gully trap class SP-1 complete with C.I grating brick masonry chamber with water tight C.I Cover with frame of 300X300mm size (inside) the weight of cover to be not less than 4.5 kg and frame to be not less than 2.70 kg as per standard design. Gully trap shall be provided in the situations where shown on the drawings.

1.2.9 Ball Valve with PVC Float

The ball valve shall be brass high pressure type and shall conform to IS -1703. The ball shall be of high quality polythene to withstand the required pressure with all necessary fittings and shall conform to relevant IS. Ball floats, excluding floats shall be of brass. The float shall be of PVC. The minimum finished mass of ball valves (excluding float). Thickness of float shall be as specified in MES SSR 2020.

1.2.10 Globe / Gate Valve & Non-Return Valve

These Valves shall be in Gun Metal conforming to IS Codes and shall be of approved make. 1 Stop valves, cast copper alloy, screwed down, high pressure, with crutch or

butterfly handle, screwed both ends for iron pipe or for unions and fixed

1.2.11 CP Items

Angle Valves, Bib Taps, Pillar Taps, Bottle Traps, Health Faucets and Towel Rings conforming to IS 8931-1993 shall be of cast copper alloy finish or with chromium plated finish as specified. Fittings shall be ISI marked and shall be as per approved makes.

1.2.12 Urinal Bowls & Partitions

White Vitreous China Flat Back Urinal Bowls of Half Stall Square type Urinal Bowl Flat with necessary Waste Coupling, Waste Pipe, Spreader, S or P Traps etc. complete of approved make, with 2nd class Marble Slab Partition of 1.50 mts x 0.6 mts of approved color shall be provided.

1.2.13 Soap Dish

White Vitreous China make Soap Dish of approved make shall be provided.

2 INTERNAL SEWAGE PIPES AND FITTINGS

General location of soil, waste, vent pipes are indicated in the drawings. Detailed layout shall be marked on the walls in colored chalk and approved by Engineer-in-charge before execution of work.

2.1 All soil, waste and Vent pipes including fittings shall be PVC SWR 6 kg / sqcm. The pipe fitting, laying and jointing shall be done all as specified in MES SSR 2020.

2.2 The vent pipes shall be taken from soil pipes to a height to 30 / 60 cms, height for inaccessible roof and 2 m above in case of accessible roof measured from top of roof (of last storey) to the bottom of the cowl. Cowl shall be provided on top of vent pipes and shall be fixed with solvent supplied by the manufacturer.

2.3 Soil pipes shall be taken upto 45 cms below ground level and provided with ducks foot bend.

2.4 The waste pipe shall be taken upto 15 cm. below plinth protection level and provided with ducks foot bend.

2.5 All exposed bends / branches and other junctions shall be provided with oval pattern access doors with bolts as per relevant IS and 3 mm rubber insert packing to make them air and water tight.

2.7 The branch connection with the vertical pipes shall be so arranged that the vertical pipe is at least 5 cm away from the face of the wall. It should also be ensured

that no joint between branch piece and vertical pipe terminates. Irrespective of what is shown on drawings, separate stacks for soil, waste and anti-siphonage pipes shall be provided.

2.8 Stack Clamps of required dimensions made out of 50 mm x 5 mm MS Flats with necessary Bolting system shall be used for securely tying the Vertical Pipes to Walls.

2.9 Irrespective of what is shown on drawings, sizes of pipes shall be as follows: -

- (a) Soil pipes - 110mm bore
- (b) Waste pipes - 75mm bore
- (c) vent pipes - 75mm bore

2.10 Smoke Test

All soil, waste and vent pipes shall be subjected to smoke test as specified in MES SSR 2020.

3 INTERNAL WATER SUPPLY

Internal water supply includes, all pipes & fittings, cutting chasing of walls and making good are deemed included in the unit rates of Pipes.

3.1 The following Indian Standards shall be applicable in addition to those mentioned in MES SSR 2020.

IS No.	Subject
1172	Basic requirement for water supply, drainage and sanitation (Revised)
2065	Water supply in building code of practice 2005.

3.2 Material

3.2.1 All materials including fittings, accessories, etc., shall be of approved make and shall comply with appropriate Indian standards and ISI marked.

3.2.2 Angle Valves, Bib Taps, Pillar Taps, Bottle Traps, Health Faucets and Towel Rings conforming to IS 8931-1993 shall be of cast copper alloy finish or with chromium plated finish as specified. Fittings shall be ISI marked and shall be as per approved makes.

3.2.3 CPVC pipes of SDR 11 conforming to latest IS specifications (duly ISI marked) and of make as per approved makes. The pipes shall be CPVC pipes confirming to the requirement of IS codes. They shall be of the diameter specified in

the design by the nominal bores of the pipes. The pipes and sockets shall be clearly finished, well done in and out free from cracks, surface flaws, laminations and other defects. All screw threads shall be clean and well cut. The ends shall be cut clean and square with the axis of the tube. Unless otherwise specified the pipe below ground or concealed or installed on walls or floor shall be SDR 11.

3.3 CP Bath Room Fittings & Other Accessories

The technical specification of CP Bathroom fittings (Quarter Turn) are as under:- The minimum wall thickness of the casted body shall not be less than 2.0mm at any section and minimum 0.6mm for tube wherever used. The operation knob shall be made of Brass Casting / Brass Rod wherever used is given below:-

Constituents	Composition %	Brass
Rod	Brass Casting	
Copper	58.0 – 63.0	56.0 – 59.0
Tin	0.0 – 1.0	-
Lead	0.5 – 2.5	2.0 – 3.5
Nickel	0.0 – 1.0	-
Iron	-	0.0 – 0.35
Aluminum	0.2 – 0.8	-
Manganese	0.0 – 0.5	-
Total Impurity	0.0 – 0.2	-
Zinc	Remainder	Remainder

This fulfills requirements of EN 200.

(c) The seat bore at inlet and outlet of the body and internal water passage of the body for 15mm nominal size shall be minimum 12.7mm. Better flow than Type I of EN 200. Minimum flow is 22.0 Liters / minute at 3.0 bar.

(d) Thread size of bonnet shall be M28 x 1.5 made of Brass Rod as per IS:319–1989, meets this requirement having composition mentioned at above para (b).

(e) Spindle used in the cartridge shall be made of extruded brass rods as per IS:319. Major diameter = 16.9 mm and smaller diameter =11.9 mm

(f) Ceramic Disc diameter should be 21.0 mm

(g) Rubber “O” Ring of sizes 24 x 2.5mm, 8 x 2.2mm, 12 x 2.5mm shall be provided with following composition;-

Shore hardness – 70 + 30

Tensile Strength Kgf / cm² – minimum 125

Elongation (%) – minimum 230

Specific Gravity – minimum 1.22

It must have food grade conformity.

(h) The thread provided for the fitting of the component to the wall fitting shall pass through G½ . or G¾.

(j) The item shall be made of brass and the chemical composition of the same must be as per IS:1264–1989 and similarly all parts made from Brass Rod as per IS:319–1989. Chemical composition mentioned at above para (b).

This fulfills requirements of EN 200.

(k) The minimum plating thickness at all points of the plated body section and knob shall conform to the following specifications as per IS:1068;

Nickel – minimum 10 micron

Chromium – minimum 0.3 micron

Beside thickness, the product should pass minimum 200 Hrs. of Salt Spray test per EN 248 or CSA B125.

(l) The product shall withstand a pressure of 25 Kg./cm² for a minimum period of 5 minutes during which period there shall no sweating or leakage from the product as per EN 200.

(m) 10mm dia food grade braided hose shall be used in Central Hole Basin Mixer and it shall withstand pressure of 10 Kg/cm². It should have approval for food grade conformity.

(n) Aerator: The aerator shall as per EN: 246. This eliminates oxygen deficiency present in water.

(o) Finish: the CP bathroom fittings shall be free from all visual defects like pinholes, grinding marks, scratches etc. as per EN 248.

3.4 Pipe Fittings

24.4.1 The fittings shall be of CPVC as called or designated by the respective nominal bores of the pipes for which they are intended. The fitting shall have screw threads at the ends and conform to the requirements of IS: 554. Female threads of fitting shall be parallel and male threads (except on running nipples and collars or unions) shall be taper.

3.4.2 Cutting, Laying and Jointing

The pipes and fittings shall be inspected at site before use to ascertain that they conform to the specification given above. Defective pipes shall be rejected. Where the pipes have to be cut, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the pipe dies and taps carefully in such a manner as it shall not result in slackness of joints when two pieces are jointed together. The taps and dies shall be used only for straightening the screw threads which have become bent or damaged and shall not be used for turning of the threads so as to make them slack.

The pipes shall be cleaned of all foreign matter before being laid. In jointing the pipes the inside of the socket and the end of the pipes shall be rubbed over with cloth . Care shall be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all time free from dust and dirt

during the fixing. After laying, the open ends of the pipes shall be temporarily plugged to prevent access of water, soil or any other foreign matter.

a. The contractor shall employ licensed skilled plumbers for all internal water supply works. Layout of pipes for internal water supply work shall be as indicated on drawings and as directed by Engineer-in-charge.

a. The requirement pertaining to materials conform to with National Building Code, workmanship, testing, recording of installations shall be all as specified in MES SSR 2020. Laying and jointing of CPVC pipe shall be in accordance with MES SSR 2020 Schedule.

b. All pipe work shall be laid or fixed to be completely airtight and water tight as specified.

c. Testing of pipe shall be carried out as specified in MES SSR 2020. Record of testing shall be maintained separately for each block.

d. Water tubing fixed/laid inside the building shall be concealed in wall.

3.5 Internal Work

3.5.1 Pipes shall run on the wall inside the toilets and kitchen and on the surface in the service ducts. For exposed pipes, the fixing shall be done by means of standard pattern holder bat clamps, keeping the pipes about 15cm clear of the wall. When the pipe is concealed, chasing may be adopted. For pipes fixed in the ducts or recesses etc. sufficient space shall be provided to work on the pipes, with the usual tools. Pipes shall not ordinarily be buried in solid floors. Where unavoidable, pipes may be buried for short distances provided adequate protection is given against damage. Where a pipe is passing through a wall or floor provision shall be made for expansion and contraction. Where pipes are encased within chases made in the wall, they shall be fixed to the wall with clamps so as to prevent movement before filling in and making good the chase. The pipe should not come in contact with lime under the floors, the pipe shall be laid in a layer of sand filling made under concrete floors.

3.5.2 Irrespective what is shown on drawing one angle valve 15 mm bore shall be provided in kitchen for aqua guard

3.5.3 Workmanship of Pipes & Fittings

3.5.3.1 The contractor shall use proper bends / elbows / tees at turning / corners. Bending of pipes shall be done by tools as per recommendation of manufacturer. Bending of pipes by hand is not permitted.

3.5.3.2 Unions shall be provided at appropriate as ordered places by the Engineer-in-charge without any extra cost to the department so that in repair, etc, long lengths of pipes are not to be taken down.

3.5.3.3 In case of concealed pipe up to 20 mm dia all pipes & fittings inside the buildings shall be embedded in walls/ floors. Pipes fixed on walls shall be secured with approved pipe hooks at about 0.75 meter intervals.

3.5.3.4 As far as possible, pipes shall be fixed in shafts (where applicable) in such way so that they do not give an ugly appearance inside. Pipes shall be fixed 15mm away from the walls where they are required to be embedded/ concealed.

3.5.3.5 Proper unions, sockets shall be provided in rising/ delivery main to end from service tank before or after the stop valve without any extra cost to the Government.

3.6 Record of Drawings

Three copies of line plans of completed work indicating the line of pipe, sizes, position of fittings and water control valve, etc., shall be submitted by the contractor to the Engineer-in-charge, on completion of work.

3.7 Testing of Pipelines

Pressure and leakage tests of pipelines and fittings shall be carried out as per clauses provided in MES SSR 2020.

4 EXTERNAL SEWAGE DISPOSAL SYSTEM

4.1 External Sewage Disposal System starts after the Gully Trap / Inspection Chamber.

Soil / drain pipes from ducks foot bend at Gully Trap & Inspection Chambers shall be of PVC SWR 6 kg / sq cm and connecting all the Manholes up to STP.

4.2 Manholes

First Manhole shall be of Circular manhole 122 cm diameter and 1.68 m deep (internal dimension) shall be constructed as shown on drawing using CC blocks and plastered from inside with 15mm thick in CM (1:4) finished with extra cement slurry. It shall be set in cement concrete (1:3:6) Type C-1 foundation with depth equal to 15cm and PCC Kerb of (1:2:4) type B-1 on top of CC block masonry all around Cement Concrete Cover of size 60 cm x 60 cm as shown on drawing. PCC benching inside manhole chamber shall be done in Cement Concrete (1:3:6) Type C-1 of size as shown on drawings. Manhole shall be provided in the situations where shown on the drawings.

The manhole shall be provided all as shown on drawings & as directed by the Engineer-in-charge. The broad specifications for various items of work required for construction of manholes are as follows:-

- i) Excavation in any type of soil, return filling and ramming and disposal of surface spoil unto distance not exceeding 50 meters.
- ii) PCC in Foundation (1 :3:6) Type C-2.
- iii) CC block work in cement and sand mortar 1 : 4.
- iv) 15mm thick plaster internally in cement and sand mortar 1 : 3 mixed 'with waterproofing compound as specified here in before with surface even & smooth without using extra cement. External surface shall be pointed flush as the work proceeds.
- v) PCC benching and kerb in PCC (1:2:4) Type B-1.
- vi) Manhole covers and frames shall be RCC medium duty 560mm dia
- vii) Manholes shall pass the water test as specified in MES SSR-2020 and contractors percentage shall include for the aforesaid test and dewatering sub soil water if encountered during the execution of the work and no extra payment on such account shall be admissible to the contractor.

4.3 Sewer & Wastewater Pipes in PVC SWR Pipes

PVC SWR Pipes of 6 kg / sq cm shall be laid all as per Specifications in BOQ. Necessary Slope for the Sewer Pipes shall be maintained to dispose the sewage water freely, preferably 1 in 200.

4.4 Concrete Bedding and Hunching for Sewer Pipes

Bedding, hunching and surrounding / encasing to glazed stoneware pipes shall be with PCC (1:4:8) as directed by Engineer-in-charge and as shown on drawings and all as specified. However, thickness of concrete bed below pipe shall be 10 cm for pipes up to and including 150mm dia and 15 cm for pipes more than 150mm dia irrespective of what is shown on drawings.

4.5 Water Test

SWR pipes shall be subjected to water test as specified in MES SSR-2020. The test shall be carried out twice, once after the pipes are laid and jointed & second time on completion of the work. No extra payment on such account shall be admissible to the contractor.

4.6 Smoke Test

All soil waste, vent and pipes shall be subjected to smoke test as specified in MES SSR (2020).

Site clearance

The contractor shall clear the site of any trees, shrubs, grass and rubbish to enable the proper execution of the work. On successful completion of the work the contractor shall clean the site of all surplus, material, equipment and accessories, to the satisfaction of the Engineer-in-charge.

Type of Water Supply

Water Supply will be from already existing UG sump from there tapping to be taken.

All pumps shall be laid out generally in accordance with the drawings achieving economy of space and piping.

All pumps shall be tested for the rated performance in the presence of the Engineer-in-charge. representative and got approved.

PUMP, ACCESSORIES AND ASSOCIATED ELECTRICAL WORKS

1. Pumping Sets

Water Supply Pumps (For Domestic Water Pumps)

A) Water supply pumps shall be suitable for clean filtered water. Pumps shall be single or multistage, horizontal centrifugal Monoblock / close coupled pumps with C.I body, CI/S.S./ bronze impeller, En 8 /stainless steel shaft, either directly mounted on TEFC electric motor shaft or coupled by means of a flexible coupling and C.I. base plate.

B) Each pump shall be provided with a totally enclosed fan cooled induction motor of suitable H.P. The motors shall be suitable for 400/440 Volts, 3 phase, 2900 rpm, 50 cycles A.C. Power supply.

C) Each pumping set shall be provided with a 100 mm dia gunmetal "BOURDEN" type pressure gauge with gunmetal isolation cock and connecting piping.

D) Provide vibration eliminating pads appropriate for each pump.

E) Pump capacity —motor — 1 hp approx. or as per BOQ.

F)

2 Submersible Sump Pumps

Pumps shall operate with high water level in sump and stop at low water level by means of an electronic level controller / float ball valve.

- A) Pumps for sump drainage shall be single stage, single entry pump.
- B) Each pump shall *be* provided with water cooled in built squirrel cage induction motor suitable for 230 volts, single / three phase $\pm 10\%$, 50 Cycle A.C. power supply.
- C) Each pump shall be provided with liquid level controller for automatic operation of the pump between predetermined levels.
- D) The pumping set shall be for stationary application and shall be provided with pump connector unit. The delivery pipe shall be joined to the pump through a rubber diaphragm, and bend and guide *pipe* for easy installation.
- E) Pump shall be provided with all accessories and devices necessary and required for the pump to make a complete working system.
- F) Pump capacity — As per Design & BOQ.
- G) The one number sump pump set of C.I body , CI impeller , chrome steel shaft with common control panel, timer unit for cyclic operation in each sump pump, level controllers, water proof cables all complete as required..

3 Level Controller

Provide and install low voltage transistorized, conductivity / magnetic type level controllers or as specified in BOQ. Each level controller shall be provided with required number of PVC sheathed stainless steel probes. All sumps shall be provided with two pumps, one running and one standby. The pump panel shall be provided with an Auto/Off/Manual and a pump selector switch. At high water level conditions the pump selected by the selector switch will first start automatically. If for some reason the level continues to rise, the second pumps would start automatically at extra high level. If for some reason the level of water in the sump continues to rise then a third sensor would provide an audio visual alarm at specified point. Each controller shall be provided with an audible alarm for low water level and High water level in underground tank/overhead tank.

A) Domestic Water Pumping System

To start/cut pump at high water level and stop at low water level in the sump.

B) Sump Pump

To start pump at high water level and stop at low water level in the sump.

C) OHT

To start the pump at low level & stop at high level in over head tank (OHT).

4 Vibration Eliminators

Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump. Length of the connector shall be as per manufacturers details. Flexible connector shall be of approved make only.

Shop Drawings

The contractor has to submit the model of submersible pump that he proposes to install. The shop drawings for electrical panels shall also be submitted for approval before the installation.

Installation, Commissioning and Guarantees

Installation

- a) The pumps and accessories shall be installed in a true workman like manner true to level and grade in accordance with the best current practice.
- b) Contractor shall employ sufficient and proper equipment's for lifting and placing of pumping equipment, in a manner which shall not strain or cause damage to the existing structures. If any damage is done, the sample shall be made good to the satisfaction of the Engineer-in-charge 's Representative without any additional cost.
- c) The contractor shall submit detailed shop drawing showing sizes of all piping, valves, etc. for approval. The work shall be started only after approval of shop drawings.

Commissioning

a) On completion of the work in all aspects, the vendor shall start up the pumps in a manner normally done for the continuous operation for a period of not less than 48 hours and shall rectify and adjust the pumps and equipments for leakages and balancing the system.

b) After satisfactory commissioning of the pumps, the contractor shall conduct performance tests to satisfy the Engineer-in-charge 's Representative that all pumps and equipment's are performing to the rated outputs of any or all pumps and equipment shall be rectified or replaced if the same is not performing in accordance with the specifications.

Guarantees

a) On award of the work the vendor shall submit a guarantee covering the quality and performance of all materials and installations under the contract. This guarantee shall cover each and every material whether manufactured by the contractor or not.

b) Vendor shall specify a suitable procedure to test the rated performance of the equipment and the system and shall provide all necessary equipments, gauges, etc. for conducting such tests.

MATERIALS / FITTINGS / FIXING ACCESSORIES

All Sanitary ware (except flushing cistern) shall be of white vitreous china best quality ISI marked. The samples of sanitary fittings, fixing accessories shall be approved by the Engineer-in-charge before bulk procurement for incorporation in the work. Sanitary ware shall be of makes as mentioned in the list of approved makes/ agencies conforming to the catalogue numbers where referred to in these tender documents. ISI marked fittings of these brands shall be provided instead of those without ISI marked.

Stainless Steel Kitchen Sink

Kitchen sink shall be of 1mm thick Stainless Steel of size 610 x 510 mm (24" x 20") (Overall). Sink shall be connected with 32mm dia PVC waste pipe of flexible type sink shall be provided with CP Swivel type wall mixes.

The branch connection with the vertical pipes shall be so arranged that the vertical pipe is at least 5 cm away from the face of the wall. It shall also be ensured that no joint is given between branch piece in floor and vertical pipe.

Stainless Steel Water Cooler

cold and plain water dispenser with refrigerator 80 TO 100 LTRS WITH

- Adjustable cold water thermostat
- Seam welded stainless steel tank
- Pre-coated outer body for better corrosion resistance
- Mechanically expanded condenser
- Front panel in stainless steel
- Sturdy moulded/flat/extended plastic legs
- Auto cut-out
- Riveted body assembly
- Over-load compressor protection
- Storage capacities: 20 L to 150 L

LIST OF STANDARD CODES

List of Various standard IS Code will be referred for Designing :

SI.No.	IS: Code No.	Description
	CPHEEO	: Manual on Sewerage and Sewage Treatment (2 nd Edition) Manual on Water Supply and Treatment.
1	IS:651:1992	: Specification for salt glazed stoneware pipes and fittings (5th rev.) (Amendment 1)
2.	IS:456:2000	: Code of practice for plain and reinforced concrete
3.	IS:783:1985	: Code of practice for laying of concrete pipes (1st rev.)(amendment 1)
4.	IS:4127:1983	: Code of practice for laying of glazed stoneware pipes (1st rev.)
5.	IS:780:1984	: Specification for sluice valve for water works purposes (6th rev.) (50 to 300 mm size) (amendment 3)
6.	IS:1172:1993	: Code of basic requirements for water supply, drainage & sanitation (4th rev.)
7.	IS:1200 (Part-16):1979	: Code of practice for methods of measurements of building and civil engineering works: Part 16 laying of water and sewer lines including appurtenant items (3rd

8	IS:1200(PART-19):1981	:	Code of practice for methods of measurements of building and civil engineering works: part 19 water supply, plumbing and drains (3rd rev.)
9	IS:1742:1983	:	Code of practice for building drainage (2nd rev.)
10	IS:13095:1991	:	Butterfly valves for general purposes
11	IS:5312 (part 1):2004	:	Swing check type reflux valves (non-return valve): part 1 single door pattern (1st rev.) (amendment 1)
12	IS:1726:1991	:	CI manhole covers & frames (3rd rev.)
13	SP: 35(S&T)-1987	:	Hand book on water supply and drainage by Bureau Of Indian Standards.
14	IS: 15778:2007	:	Chlorinated polyvinyl chloride pipes for potable hot and cold water distribution supplies- specifications
15	IS:2065:1983	:	Code of practice for water supply in buildings

16	IS:2556, Part I to	:	Specifications for Vitreous China Sanitary Wares.
17	IS:5455: 1969	:	Specification for cast iron steps for manholes
18	IS: 1726: 1991	:	Specification for C.I manhole covers and frames (Part I
19	IS: 4984: 1995		Specification for high density polyethylene pipes for potable water supplies, sewage, and industrial effluents (second revision)
20	IS: 4985 :2000	:	Specification for unplasticized PVC pipes for potable water supplies
21	IS: 783: 1985	:	Code of practice for laying of concrete pipes.
22	IS: 2692: 1989	:	Specification for ferrules for water services (first
23	IS: 7634: 1975	:	Code of practice for plastics pipe work for potable water supplies (Part I)
24	IS: 7634: 1975	:	(Part III) Laying and jointing of unplasticized PVC pipes.
25	IS: 13592 —1992	:	Specification for UPVC pipes for soil and waste discharge systems buildings including ventilation and
26	IS: 14735 —1999	:	Specification for UPVC pipes for soil and waste discharge system, ventilation and rain water system.
27	National Building Code of India, 2016	:	Part 9 Plumbing Services

S.No	APPROVED LIST OF MAKES FOR PHE	
		Details
1	SFRC Manhole Cover and Frame	KK / ISI Marked as approved by Engineer-in- charge
		Nu-TEC
		Kutty
2	Mirror	Atul
		Modiguard
		Saint Gobain
3	Cockroach Trap	Chilly
		Noway
		Prayag Polymers (P) Ltd (Prayag India)
4	Brass Ball Cock with (Float valve) ,NRV	ZOLOTO
		RB
		LEADER
5	PVC Flushing Cistern and Plastic Seat and Cover(Solid Heay Duty)	Parryware
		Hindware
		Cera
6	Vitreous China sanitary ware	Parryware
		Cera
		Hindware
7	CP Bathroom Fittings and Accessories	CERA, HINDWARE
		Havells India ltd (CRABTREE)
		Parryware Roca Private Ltd (PARRYWARE)
8	CPVC Pipes with Fittings	Ashirwad
		Prince
		Supreme
9	UPVC Pipes &Fittings / SWR	Ashirwad

		Prince
		Supreme
10	Kitchen/Lab Sink Stainless Steel	Jindal
		Hindware
		Jyothi India (NIRALI)
11	Glazed Stone Pipes & Fittings	ISI Marked as approved by Engineer-in-charge
12	CI cover & Frame	NECO
		BIC
13	Gate Valve	Zoloto
		RB
		Leader
14	SS WATER COOLER	BLUE STAR
		VOLTAS
		USHA
15	Air release valve	Kirloskar
		RB
		Zoloto

SEWAGE TREATMENT PLANT TREATMENT SCHEME

SBR is a form of Activated Sludge Process. It is a Batch process. This fill-and-draw variable- volume SBR system can achieve excellent treated effluent quality.

SBR's have found application in large scale municipalities (up to 1 million population equivalent), as well as the modular expansion and up-rating of existing wastewater treatment facilities. SBR technology has the advantage of being much more flexible than conventional activated sludge processes in terms of matching reaction times to the concentration and degree of treatment required for a particular wastewater.

The main benefits of the SBR system are less civil structures, inter-connecting pipe work, and process equipment and the consequent savings in capital and operating costs. SBR's operate on a time-based process cycle to achieve the process conditions necessary for carbonaceous oxidation, nitrification, denitrification and biological phosphorus removal. In addition, solids-liquid separation, treated effluent removal, and solids wasting are also incorporated to complete the process cycle.

Capacity : **50 KL/DAY**

Treatment Scheme :
 Bar Screen –Collection Tank – Raw Sewage Transfer Pumps - Aeration Tank - Air Blowers & Diffusers –
 Decanter Tank – Filter Feed Pumps – Pressure Sand Filter – Activated Carbon Filter – Chlorine Dosing System
 - Treated Water Tank– Sludge Transfer Pumps - Sludge Holding Tank – Sludge Dewatering system.

SEWAGE TREATMENT PLANT DESIGN BASIS

Influent Sewage Characteristics

Parameters	Unit	Range
Nature of Influent		Sewage
Flow	KLD	50
pH	--	6 – 8
BOD ₅	Ppm	250 - 350
COD	Ppm	300 - 500
Total Suspended Solids (TSS)	ppm	250 – 300
Oil & Grease	Ppm	≤10

Quality of Treated Water

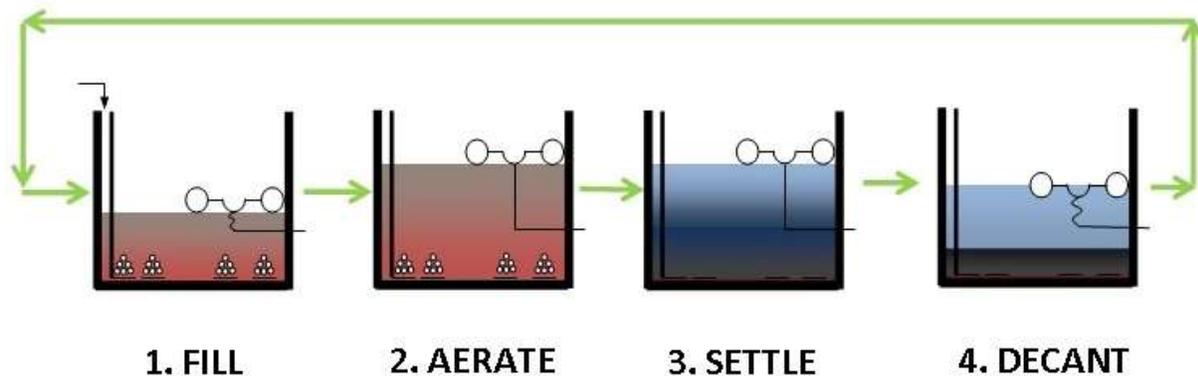
Parameters	Unit	Range
pH	--	6.5 – 7.5
BOD ₅	ppm	<20
COD	ppm	≤60
Total Suspended Solids (TSS)	ppm	≤ 20
Oil & Grease	Ppm	≤5

OPERATING PRINCIPLE OF STP BASED ON SBR TECHNOLOGY

Operating Principle of SBR:

SBR system is based on the activated sludge system that performs operations based on time rather than space, whereas a conventional activated sludge system requires more space. Housed in a single unit, our reactor can accomplish biological treatment and secondary clarification with a timed, controlled sequence thus eliminating the need of multiple tanks or expensive membranes for treatment. This process achieves high quality treated water with low nutrient levels, ready for recycling.

The various phases in a typical SBR process cycle usually comprise the following: -



1. Fill - Wastewater enters the SBR tank and mixes with activated sludge mixed liquor solids within the tank.
2. Mixed Fill - Influent wastewater and activated sludge are mixed together to produce anaerobic / anoxic conditions in biological nutrient removal (BNR) systems.
3. React - Aeration of the tank contents. Biological reactions occur until the desired degree of treatment has been achieved.
4. Settle - Aeration is stopped and the activated sludge solids settle to form a blanket on the base of the reactor vessel, leaving an over-layer of treated effluent.
5. Decant - Clarified treated effluent (supernatant) is removed (decanted) from the tank without disturbing the sludge blanket.

The core part of the plant is a reactor with sewage feed & treated water outlet. These reactors can be pre-engineered for different hydraulic and organic load capacities, modularly designed and can be installed with RCC or pre-fab tanks.

Cost Advantages

- Reduced capital cost.
- Up to 30% less basin volume to achieve same operating performance as an SBR
- Less Concrete
- Less Excavation
- Smaller Land Area
- If others size basins as an SBR, then operating the process as an ICEAS will allow up to 30% greater flow

Reduced Operating Cost

- No supplemental mixing required for the aeration system
- Proven D.O. control system for optimizing energy usage

Reduced Installation Cost

- No influent or effluent control valves
- No retrievable equipment required
- Decanter easy to install

Reduced Maintenance Cost

- No influent or effluent control valves
- Continuous flow enables shut down of one basin to facilitate maintenance of equipment when required
- Retrievable aeration facilities not required
- Decanter easy to service from walkway

The Sewage Treatment plant has been designed based on the following characteristics of waste water collected at the outlet of septic tank:

Total Quantity	:	50 KL/day
pH	:	6.5 to 8.0
Total Suspended Solids	:	150-250 mg/L
Biochemical Oxygen Demand	:	250-350 mg/L
Chemical Oxygen Demand	:	400-600 mg/L
Oil&Grease	:	30-40 mg/L

PROPOSED TREATMENT:

1. The out fall sewer main from the last manholes, (up to 50 m³ per day) will be let into Bar Screen chamber by gravity flow. Solids particles will be intercepted by a screen and the screens will be manually cleaned with suitable rake arrangement.
2. The sewage will be pumped to SBR Tank through Raw Sewage Transfer Pumps where Aeration, Settling & Decanting occurs sequentially for the reduction of organic pollutants and sludge settlement. In these tanks oxygen will be provided by fine bubble diffused aeration system.
3. After the biological treatment and settling in the SBR tanks, the settled sludge at the bottom will be transferred to Sludge Holding Tank Via Sludge Transfer Pumps and the clear supernatant would overflow into the decant water tank.
4. The clarified water will be then pumped to the Sand and Carbon Filters to remove suspended solids, colour and odour from the treated sewage. Further the treated water in Treated Water Tank is chemically dosed to kill pathogenic micro organisms. Further this water can be used for Gardening & Flushing Applications.
5. Sludge from Sludge Holding Tank is further pumped through Screw Pump to a Filter Press to convert wet sludge into dry sludge. This sludge can be used as organic manure and, sold as such.

The treated Sewage shall have the following characteristics.

pH	:	6.5 to 7.5
Total Suspended Solids	:	< 50mg/L
Biochemical Oxygen Demand	:	< 20 mg/L
Chemical Oxygen Demand	:	< 75 mg/L
Oil and Grease	:	< 5 mg/L

PROCESS DESIGN

- The overall treatment plant unit process is much simple than a continuous process due to a lack of primary and secondary clarifiers. Coarse / fine screens are used at the inlet to remove large solids. Depending on effluent – tertiary treatment can be provided as per site requirement.
 - There are five stages in the treatment process:
 1. Fill
 2. Aeration
 3. Settle
 4. Decant
 5. Idle
- The inlet valve opens and the tank is being filled in, while mixing is provided by mechanical means (no air). This stage is also called the anoxic stage.

- Aeration of the mixed liquor is performed during the second stage by the use of fixed or floating mechanical pumps or by transferring air into fine bubble diffusers fixed to the floor of the tank.
- No aeration or mixing is provided in the third stage and the settling of suspended solids starts.

SEWAGE TREATMENT PLANT SCOPE

1) BAR SCREEN

S.No	Description	Details
1.	Size	300 mm x 300 mm
2.	MOC	SS
3.	Angle of Inclination	45 ⁰
4.	Spacing	20mm
5.	Make	Local Make
6.	Quantity	1 No

2) RAW SEWAGE TRANSFER PUMPS

S.no	Description	Details
1.	Make	Xylem/Toshio/Kirloskar/Eq
2.	Type	Submersible
3.	Discharge in Cu.m/Hr	6.25 Cum/Hr
4.	Total Head in Meter	10Mtrs
5.	Rating in kW / HP	1.4KW
6.	Quantity	2 Nos
7.	MOC	
8.	Casing	CI/SS
9.	Impeller	CI/SS
10.	Casing	3 Phase

3) AIR BLOWERS

S.no	Description	Details
1.	Make	A1/Everest Motors/AkashEq
2.	Quantity	2 No's(1W+1S)
3.	Capacity	75 m ³ /Hr
4.	Pressure	0.4 kg/cm ²
5.	MOC of Blower	CI
6.	Accessories	Base frames, Air filter for suction line and silencer for discharge, safety valve & pr. Gauge, V belt, V belt guard
7.	MOTOR	
8.	Rating	3 HP
9.	Power Supply	3 Phase
10.	Make	Kirloskar/Eq

4) **FINE BUBBLE DIFFUSERS**

S.no	Description	Details
1.	Make	Tecpro /SVS Aqua Technologies/Bajrang enviro engineers/Eq
2.	Type	Tubular type
3.	Size	90 mm Dias x 1000 mm Long
4.	MOC	EPDM
5.	Quantity	1 Lot for Aeration tanks

5) **COARSE BUBBLE DIFFUSERS**

S.no	Description	Details
1.	Make	Tecpro/ SVS Aqua Technologies/Bajrang enviro engineers/Eq
2.	Type	Disc type
3.	Size	80 mm Dias
4.	Quantity	1 Lot for collection tank, sludge holding tank

6) **SLUDGE TRANSFER PUMPS**

S.no	Description	Details
1	Make	Kirloskar/Lubi/Xylem
2	Type	Self-Priming Type
3	Discharge in Cu.m/Hr	1-2 Cum/hr
4	Total Head in Meter	10 meters
5	Rating in HP/kW	0.5HP
6	Quantity	2 No's
7	Material of Construction	
	Casing	CI
	Impeller	CI
	Shaft	CS
8	Phase	3 Phase

7) **FILTER FEED PUMPS**

S.No	Description	Details
1.	Make	Kirloskar/Xylem/Lubi/Eq
2.	Type	Monoblock
3.	Discharge in Cu.m/Hr	2.5 Cum/hr
4.	Discharge Pressure	2.5-3.0 Kg/cm ²
5.	Total Head in Meter	25-30 meters
6.	Rating in HP/kW	1.5HP/1.1Kw
7.	Quantity	2 No's
8.	Material of Construction	
	Casing	CI
	Impeller	CI
	Phase	3 Phase

8) PRESSURE SAND FILTER

S.No	Description	Details
1.	Design Flow	2.5 m ³ /hr
2.	Type of vessel	Vertical Cylindrical
3.	MOC of Vessel	FRP
4.	Type of Flow	Downflow
5.	Pipe Size of Inlet/Outlet	40 NB
6.	Diameter	21"
7.	Height on Straight	62"
8.	Quantity	01 No
9.	Make of Vessel	Pentair/Ion Exchange/GVAE
10.	Design Pressure	5.5 Kg/ sq.cm
11.	Working Pressure	2.5-3 Kg/ sq.cm
12.	Media	Various Sizes of sand & pebbles
13.	Media Quantity	Lot1
14.	Frontal Piping	UPVC Piping with Multiport valve

9) ACTIVATED CARBON FILTER

S.No	Description	Details
1.	Design Flow	2.5 m ³ /hr
2.	Type of vessel	Vertical Cylindrical
3.	MOC of Vessel	FRP
4.	Type of Flow	Downflow
5.	Pipe Size of Inlet/Outlet	40 NB
6.	Diameter	21"
7.	Height on Straight	62"
8.	Quantity	01 No
9.	Make of Vessel	Pentair/Ion Exchange/GVAE
10.	Design Pressure	5.5 Kg/ sq.cm
11.	Working Pressure	2.5-3 Kg/ sq.cm
12.	Media	Activated Carbon
13.	Activated Carbon	Lot1
14.	Frontal Piping	UPVC Piping with Multiport valve

10) CHLORINE DOSING SYSTEM

S.No	Description	Details
1.	PUMP	
2.	Type	Electronic Diaphragm
3.	MOC	PP
4.	Range	0-6 LPH
5.	Quantity	1 No
6.	Make	E Dose/Milton Roy/ANT/Eq
7.	TANK	

8.	Quantity	1 No
9.	Capacity	50 Liters
10.	MOC	HDPE

11) PIPING & VALVES

All interconnecting piping within plant room including Motorized valves for Decanter Mechanism and accessories. MS Piping : for Air line UPVC Piping / Valves : Finolex / Supreme/Prince Valves : Intervale /RB/Zoloto	1 Lot
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12) ELECTRICAL

Electrical Panel	Non-Compartmentalized Make: Trivolt Make of components: Schneider/L& T	1 No.
Cable & Cable Trays	Cables Make : Polycab/Havells/finolex Cable Tray : GI Perforated	1Lot.
Ammeter	Make: Schneider/L&T	1 No.
Voltmeter	Make: Schneider/L&T	1 No.
KW meter	Make: Schneider/L&T	1 No.

13) INSTRUMENTATION

Pressure Gauges	Range: 0-7 kg/cm ²	1Set
Floats	Make: Aster/H-Guru/Forbes marshall/Eq	1Set

SLUDGE DEWATERING SYSTEM

S. No	Description	Details
1.	Bag filter feed Pump	
	Flow	1 Cum/hr
	Pressure	1.0 Kg/Sqcm
	Type	Self-priming
	Make	Kirloskar /Lubi/Xylem
	Motor Rating	0.5 HP/0.37KW
	Quantity	1 No
2.	Bag Filter	
	Make	Equivalent
	MOC of Bag Filter Housing	MS Enamel Painted
	Quantity	1 No
3.	Poly Dosing system	

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	Pump	
	Range	0-6 LPH
	Make	SR Metering/Eq
	Dosing tank	
	Capacity	50 Ltrs
	MOC	HDPE
	Make	Sintex/Truflow/Prince/Eq
	Quantity	1 Set